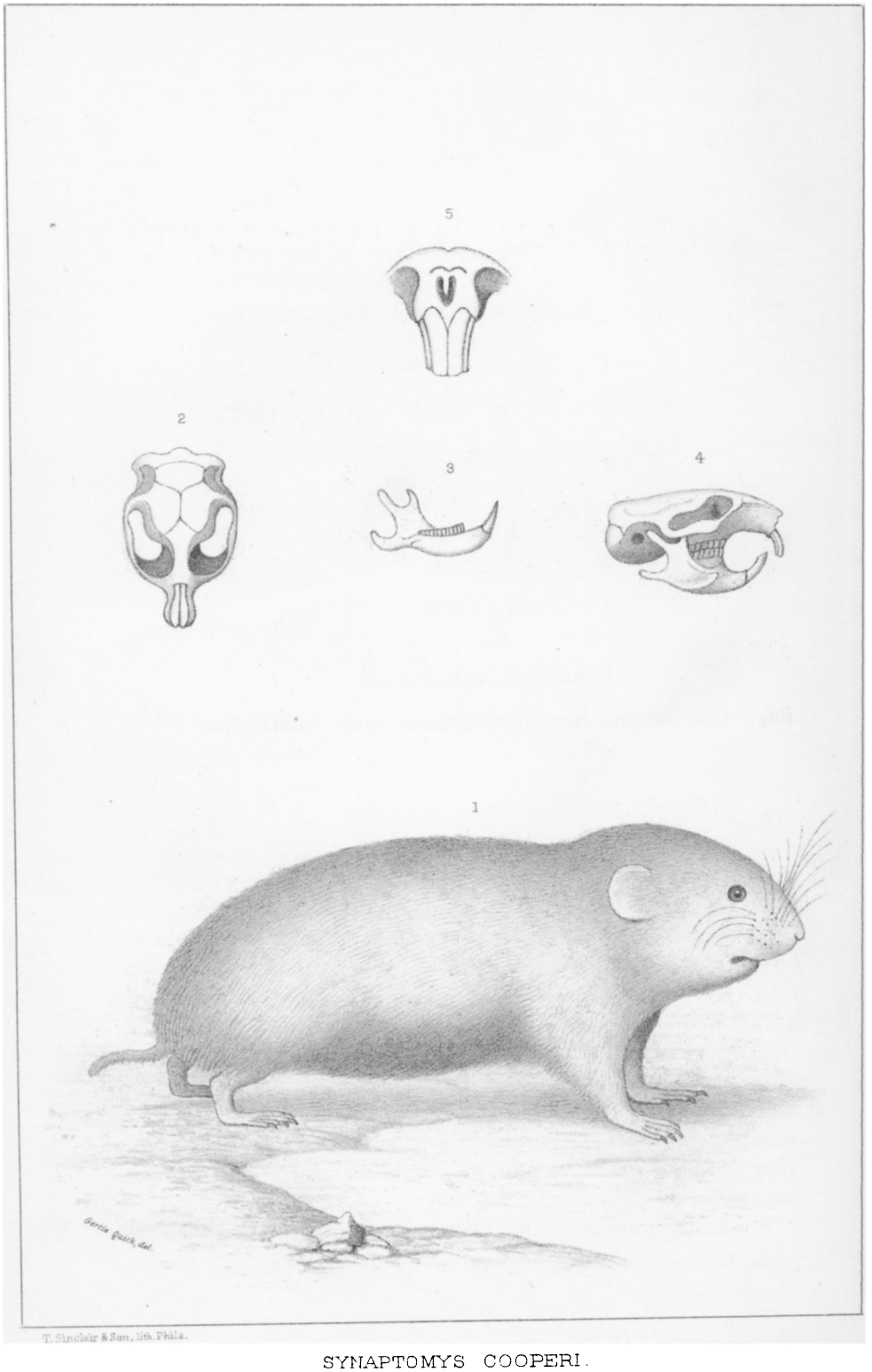

SYNAPTOMYS COOPERI.

THE

AMERICAN NATURALIST.

VOL. XIX.—*FEBRUARY*, 1885.—No. 2.

THE HABITS OF SOME ARVICOLINÆ.[1]

BY EDGAR R. QUICK AND A. W. BUTLER.

FOUR species of Arvicolinæ have been found in Southeastern Indiana, and it is to certain observations of the habits of these that your attention is called. The species referred to are *Synaptomys cooperi* Bd., *Arvicola pinetorum* LeC., *Arvicola riparius* LeC., and *Arvicola austerus* Ord. The latter is the rarest species, and *A. riparius* is by far the most common.

The credit of the discovery of Cooper's field mouse in Indiana belongs to that pioneer of Western naturalists, Dr. Rufus Haymond, who, in 1866, sent an alcoholic specimen of this mouse from Brookville to the Smithsonian Institution. Dr. Haymond says of this specimen: "I think it was in June, 1866, that I discovered this mouse about a mile north of Brookville. I thought it a common meadow mouse (*A. riparius*); when caught I put it into an old leather purse in which I had previously confined a small shrew. When I reached home I found the shrew had killed the mouse; the little murderer soon fell a victim to the law of blood revenge, and was packed with its victim in a jar and sent to the Smithsonian Institution." This mouse is numbered 9963 in the Smithsonian collection.

No other specimen was taken in Indiana for several years. In 1879 one of the writers took the second specimen found in this State, about three miles below Brookville and four miles from where the first one was taken thirteen years before. Specimen after specimen followed this one, all being taken from the same locality.

From the most reliable information obtainable, we conclude

[1] Read before the section of biology A. A. A. S. at Philadelphia, Sept., 1884.

that less than fifty specimens of this little mammal have ever been taken, of which number more than half have been secured by the writers from this same locality.

This mouse is found on hillsides in high, dry, blue grass pastures, where flat stones are irregularly scattered over the surface; it especially prefers what are known as "woods pastures," containing little or no undergrowth.

The locality whence Dr. Haymond obtained his specimen is a hillside pasture field, with no trees, sloping towards the east. The greater part of the other specimens have been taken from a steep rocky hill sparsely covered with timber, known as "Brown's hill."

Cooper's field mouse has been found breeding from February to December. It has never been known, by the authors, to bring forth more than four young at a time. In all suckling females which have been brought to our attention the mammæ have apparently been but four, one pair pectoral and one pair inguinal. Dr. Coues says (Monographs of N. A. Rodentia): "In No. 9963 (Dr. Haymond's specimen) apparently a nursing female, we find two pairs of pectoral mammæ and one pair of inguinal mammæ, without being able to make out any intervening ventral ones. It is probable, however, that the species possesses a ventral pair, making eight teats in all."

In this matter, from the light we now have upon the subject, we are not able to coincide with Dr. Coues in his views.

In young specimens the hair appears finer, shorter and more glossy than in more aged examples. As a rule the specimens just reaching maturity are darkest, but one old female shows a very dark reddish-brown back, and is dark ash below. If there is any difference in sexual coloration, the females are slightly the darker.

The nest of this species is always under cover, generally in a hollow log or stump, and is composed of fine grass. It is not so securely built as the nests of some of the other species of this family.

Cooper's mice live in winter chiefly upon the stems of blue grass and the more tender portions of the white clover. Stores of these foods may be found near their winter quarters. In November, 1883, a large quantity of the tuberous roots of the plant commonly called "wild artichoke" (*Helianthus doronicoides* Lam.)

were found in one of the store-houses of a colony of these mice.

These mice vary much in numbers in favorable localities in different years, but it is questionable whether this variation is from migration or irregular causes. In 1879 they were very common on Brown's hill, many of them frequenting the remains of an old stone mound. No other species were commonly met with in this locality at the same time. This year no examples of *S. cooperi* have been taken on the top of this hill, but a single specimen was found at the base of the hill. Since Dr. Haymond took his specimen north of Brookville no other example has been found in this direction from town, although sought for at different times.

Cooper's mouse is the most active representative of its family in this locality. It is most frequently found by turning over stones and logs, beneath which it remains concealed, especially in winter. Upon removing their covering, as the light reaches them, they are off like a flash for their subterranean paths, leaving the collector to mourn for a valuable specimen, a glimpse of which he caught as it fled before his hand could grasp the prize.

Another interesting representative of this family is the pine mouse (*Arvicola pinetorum* LeC.). This species has generally been considered rare in this locality, but in a two hours' hunt last February eleven specimens were taken by the writers. Several specimens have also been captured by a cat within a little more than a year.

Dr. Coues aptly says in his Latin description, "forma quasi-talpoidea;" the species strongly resembles the mole in form, especially in the size of its fore feet and in the strength of the forward part of its body, and also in its habits.

The runways of the pine mouse are nearly always under ground, sometimes an inch or more beneath the earth, the line of which may easily be traced by the upheaved earth.

The locality where the pine mice, to which reference has just been made, were taken, has long been a favorite place for the mice-catchers of the local society of natural history to find *Synaptomys cooperi.* On this particular occasion but a single specimen of this interesting species was taken, while almost a dozen examples of a species which had previously been regarded as rare were found in its accustomed haunts.

These examples were taken from the higher part of a steep, partially wooded hill. They apparently sought the west and south-west sides, where they were found beneath leaves, logs, stumps and stones. Upon the covering being suddenly removed they appear dazed, affording for an instant an opportunity to capture them; should the first attempt prove futile, they seek safety in the first available hiding place, but when frightened from here, hasten through their labyrinthic underground passages and are seldom seen again.

Of their breeding habits we have noted nothing. As a rule the pine mice winter in a last summer's nest, which is a round ball of blue grass blades, from four to six inches in diameter; the interior is composed of fine grass which is nicely bound together with longer blades. The nest is generally placed beneath a pile of leaves or an old stump. In winter collecting single specimens are generally observed occupying these old nests.

The pine mouse, in winter, lives upon the tender roots of young hickories, the young sprouts of the white clover (*Trifolium repens*), the fruit of the red haw (*Cratægus coccinea* L.) and the tuberous roots of the wild violet (*Viola cucullata* Ait.). The first of these he uses for luncheon while excavating his runways. It is never found stored in his burrows, but as his passages approach these roots they expand, laying bare a large portion of the root from which the bark is generally entirely removed. The other products we find buried, the latter in numerous deposits, some of which contain a gallon of tubers and extend eighteen inches below the surface of the ground. This latter article evidently forms the bulk of their winter food.

The common meadow mouse (*A. riparius*) is the most common mammal in Southeastern Indiana. It varies in numbers with the seasons. Some years the fence rows of wheat and barley fields are traversed by a network of their runways. In autumn, after the frost has cut down the more tender parts of the weeds and grass, numbers of these little rodents may be seen darting here and there through their half-covered passages. In winter they are warm friends of the farmer who leaves his corn in the shock latest. After the early snows have fallen the corn shocks will be found thickly colonized by these little pests, who find here not only a comfortable residence, but also a well-filled granary from which to draw their winter's food. In spring, when the last snows

have disappeared, one will observe where the meadow mice have advanced their passages very near the public thoroughfare, while the neighboring pastures and commons show many traces of their highways. Their food in winter is the corn found in the thriftless farmer's shocks, together with the seeds of a number of plants and the young blades of the blue grass. Their large round nests are also constructed of the blades of this and kindred grasses. They are built much after the manner of musk-rat houses, a miniature of which they closely resemble.

The single opening is below, where it connects with the runways of the animal. These nests are found in almost every conceivable place: in thickets and brier patches among the rank grass which grows there, in swampy places upon a tussock of grass, in a log or fence corner, under a pile of rubbish and very many on the open ground, especially in clover meadows, where the mice may prey upon the nests of the humble-bee.

The meadow mice breed from February to December. A succession of favorable or unfavorable circumstances, as the case may be, causes either an abundance or scarcity of specimens.

This mouse has an ingenious and patient method of securing the head from a standing stalk of grain. Selecting a stalk which gives promise of a large well filled head, the mouse cuts it off as high up as it can reach; owing to the proximity of the surrounding grain the stem will not fall, the butt end drops to the ground and another cut is made about four inches up the stalk; the process of cutting off sections of this length is repeated until the grain is within reach. Here, after a square meal, the mouse leaves a collection of straws about four inches long together with a shattered head of grain to puzzle the farmer.

Arvicola austerus, called by some authorities "prairie meadow mouse," is the rarest of all our mice here. We think Dr. Langdon very properly calls this species the "wood mouse," on account of its attachment for the more open woodland or the grassy fields or newly cleared land adjoining such. All the specimens taken here have been captured by a cat, hence we are unacquainted with its habits.

Owing to the fact that all of these species live in summer surrounded by luxuriant vegetation, much less is known of their summer habits than of their life in winter.

The species with which we are best acquainted occur at times

in great numbers, while other years they are very scarce. During the years 1878 and 1879 *Arvicola riparius* was very common and could be found in every locality, but in 1880 most of them disappeared, and for a long time they were very scarce. They have slowly increased in numbers and are now as numerous, perhaps, as ever. Whether these strange reoccurrences are the result of migrations or disease we are, from the present state of our knowledge, unable to determine.

Mice have their enemies, as do most other animals. They are caught in large numbers by the smaller hawks (*Tinnunculus sparverius* Vieill, *Accipiter cooperi* Bp., and *Accipiter fuscus* Bp.), owls (*Scops asio* Bp., and *Asio accipitrinus* Newton); cats and dogs catch them as opportunity affords. Many also are killed by their curious little enemies, the shrews.

In habits no two of the species named approach each other very nearly except in general characteristics. They all appear to be gregarious, living as a rule in colonies. The pine mouse burrows deepest, and makes the most lengthy runways. The passages made by Cooper's field mouse are never of much length, but are very sinuous and intricate. In food each species appears to partake of some particular kind or kinds found near the locality it frequents. Except in case of the pine mouse and Cooper's mouse the localities occupied by each species do not appear to overlap, each frequents a peculiar kind of region wherein it plays its part in the economy of nature.

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ON A PARASITIC COPEPOD OF THE CLAM.

BY PROFESSOR R. RAMSAY WRIGHT.

SINCE the researches of Dana, published between thirty and forty years ago, comparatively little attention has been given to the Copepoda in America. So much is this the case that Gerstæcker in his account of the geographical distribution of the order,[1] mentions only sixteen species as inhabiting the fresh waters and coast region of North America, the described forms being all fish parasites. Of late, however, important contributions to the knowledge of the fresh-water, free-living forms have appeared in this journal,[2] and new parasitic species have been

[1] Bronn's Thierreich, Vol. v, c. 1876, p. 799.

[2] S. A. Forbes. Entomostraca of Lake Michigan, Vol. XVI.
C. L. Herrick. Heterogenetic development in Diaptomus, Vol. XVII.